rubidium, potassium, sodium, lithium, barium, strontium, and calcium. A series of similar liquids to those of one of the groups of acids, of equal (not of equivalent) strength to each other, was also included.

As electrodes he employed pairs of plates of zinc, cadmium, lead, tin, iron, nickel, copper, silver, gold, palladium, and platinum; and separate ones formed of small bars of iridium.

He took each group of solutions, and measured in each liquid separately at atmospheric temperature, the "total resistance" at the two electrodes, and the separate "resistances" at the anode and cathode respectively with each metal, and thus obtained about seventy different tables, each containing about thirty-six measurements, including the amounts of "total," "anode," and "cathode resistance" of each metal, and the averages of these for all the metals.

By comparing the numbers thus obtained, and by general logical analysis of the whole of the results, he has arrived at various conclusions, of which the following are the most important:—The phenomenon of "transfer-resistance" appears to be a new physical relation of the atomic weights, attended by inseparable electrolytic and other concomitants (one of which is liberation of heat, "Phil. Mag.," 1886, vol. xxi, p. 130). *In the chemical groups of substances examined, it varied in magnitude inversely as the atomic weights of the constituents, both electropositive and electronegative, of the electrolyte, independently of all other circumstances;* and in consequence of being largely diminished by corrosion of the electrodes it appears to be intimately related to "surface-tension." He suggests that corrosion may be a consequence and not the cause of small "transfer-resistance." The strongest evidence of the existence of the above general law was obtained with liquids and electrodes with which there was the least corrosion and the least formation of undissolved films; those liquids were dilute alkali chlorides, with electrodes of platinum.

The research is an extension of a former one on "Transfer-resistance in Electrolytic and Voltaic Cells," communicated to the Royal Society, March 2, 1885. Further evidence on the same subject has been published by the author in the "Phil. Mag.," 1886, vol. xxi, pp. 130, 145, 249.

II. "A Study of the Thermal Properties of Ethyl Oxide." By WILLIAM RAMSAY, Ph.D., and SYDNEY YOUNG, D.Sc. Received May 5, 1886.

(Abstract.)

A year ago, a paper was communicated to the Society on the behaviour of ethyl alcohol when heated. A similar study of the properties of ether has been made, in which numerical values have

been obtained exhibiting the expansion of the liquid, the pressure of the vapour, and the compressibility of the substance in the gaseous and liquid conditions; and from these results, the densities of the saturated vapour and the heats of vaporisation have been deduced. The temperature range of these observations is from −18° to 223° C.

It is the authors' intention to consider in full the relations of the properties of alcohol and ether; in the meantime it may be stated that the saturated vapour of ether, like that of alcohol, possesses an abnormal density, increasing with rise of temperature and corresponding rise of pressure; that at 0° the vapour-density is still abnormal, but appears to be approaching a normal state; and that the apparent critical temperature of ether is 194·0°C.; the critical pressure very nearly 27,060 mm. = 35·61 atmospheres; and the volume of 1 gram of the substance at 184° between 3·60 and 4 c.c.

III. "On the Working of the Harmonic Analyser at the Meteorological Office." By Robert H. Scott, F.R.S., and Richard H. Curtis, F.R. Met. Soc. Received May 6, 1886.

On the 9th of May, 1878, Sir W. Thomson exhibited to the Society a model of an integrating machine, which consisted of a series of five of the disk, globe, and cylinder integrators, which had been devised two years earlier by his brother Prof. James Thomson, and a description of which will be found in the "Proceedings of the Royal Society," vol. xxiv, p. 262. Sir W. Thomson's paper describing this model will be found in vol. xxvii of the "Proceedings," p. 371; and reference should be made to both these papers for an explanation of the principle of the machine. In the communication last named it is stated that the machine was about to be "handed over to the Meteorological Office, to be brought immediately into practical work."

The model was received at the Office in the course of the month, and was at once set in action; the results of the preliminary trials, when obtained, being referred to a Committee consisting of the late Prof. H. J. S. Smith and Prof. Stokes, who, on the 5th of July following, submitted to the Meteorological Council a favourable report on the performance of the model.

The Council at once resolved to have a machine constructed, which should be specially adapted to the requirements of the work for which it was intended, viz., the analysis of photographic thermograms and barograms.

In preparing a working design for actual execution, it was found necessary to make several modifications in the details of the mechanical arrangements of Sir W. Thomson's original model, and these were